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Docket No. 0217.97R
Serial No. 09/828,634

PATENT

~~the genus *Parthenium*, (b) added *Parthenium* spp. natural resin extract or (c) combinations of (a) and (b).~~

REMARKS

Claims 1-19 are pending in the application. Claims 1-19 stand rejected.

Examiner Interview

Applicants' attorney, the undersigned, wishes to thank Examiner Rajguru for the courteous and helpful telephone interview on May 2, 2002. The Kay et al. patent cited in the Office Action and Applicants' claimed invention were discussed.

The Amendment

In the Specification

Paragraph [0041] has been amended to correct an obvious typographical error. The term "cellulose" was inadvertently left out of paragraph [0041]. It is clear that this omission was an inadvertent typographical error from the following information. The term "lignocellulosic" inherently identifies cellulose as one of the materials in the combination. Further, Applicants note in paragraph [0025] on page 7 of the specification that "all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs." Attached herewith is Chapter 13: "How Crops Can Provide Raw Materials for the Chemical Industry," in the *1992 Yearbook of Agriculture: New Crops, New Uses, New Market*; pages 87-92, Office of Publishing and Visual Communication, U.S. Department of Agriculture. This reference provides the following description: "Lignocellulosics --- By weight, the largest component of plant material is lignocellulosic material---a mixture of cellulose, hemicellulose, and lignin." This documents that cellulose is one of the components of lignocellulosics.

In the Claims

Claim 1 has been amended to clarify that the *Parthenium* spp. plant material in Applicants' composite is lignocellulosic plant material. This amendment is fully

supported by applicants' specification. See, in particular, paragraph [0029] pages 7-8; paragraphs [0032] to [0036], page 8; paragraph [0041], page 9; paragraph [0043], page 10; paragraph [0060], page 13; paragraph [0062], pages 13-14; paragraph [0065], pages 14-15; paragraph [0069], pages 15-16; paragraph [0072], pages 16-17; paragraph [0078], page 18-19, and attached pages G-13 and G-14 from *Wood Handbook: Wood as an Engineering Material*, General Technical Report FPL-GTR-113, Forest Products Laboratory, Forest Service USDA, March 1999 (which reference is cited in Applicants' specification on page 30). As noted in attached pages G-13 to G-14 of the Handbook, the term "wood-based composite panel" is "a generic term for a material manufactured from wood veneer, strands, flakes, particles, or fibers or other lignocellulosic material and a synthetic resin or other binder (emphasis added). The definitions of such composites, e.g., panel, plywood, particleboard, fiberboard, etc., on the attached pages G-13 and G-14 of the Handbook, further recite that the plant material is lignocellulosic or woody.

Claim 16 has been amended to clarify that the composite recited in claim 1 may further comprise: (a) lignocellulosic plant material from a plant other than the genus *Parthenium*, (b) added *Parthenium* spp. natural resin extract or (c) combinations of (a) and (b). Support therefor is in the specification, paragraphs [0010], pages 4-5; paragraphs [0030] and [0031], page 8, and original claim 16.

The amendments do not introduce new matter.

Applicants seek reconsideration and reexamination of their application on the basis of the foregoing amendment, the accompanying attachments, and the discussion that follows.

Rejection Under 35 U.S.C. 112, Second Paragraph

Claims 1, 3, 4, 6, and 16 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite in reciting "spp.". Applicants respectfully submit that the claims are not indefinite for the following reasons. As noted in the attached record from *The American*

Heritage® Dictionary of the English Language, Fourth Edition, 2000 by Houghton Mifflin Company, the term “*spp.*” is the abbreviation for the term “*species*” (plural). This is also clear from paragraph [0027], page 7, of Applicants’ specification. In view of the foregoing, it is submitted that Claims 1, 3, 4, 6, and 16 are not indefinite.

Claim 16 further stands rejected under 35 U.S.C.112, second paragraph, as being indefinite. The Examiner did not specify the reasons for this rejection in the Office Action.

Applicants respectfully submit that claim 16, as amended, fully meets the requirements of 35 U.S.C.112, second paragraph, for the following reasons. Claim 1 recites that Applicants’ composite comprises *Parthenium spp.* lignocellulosic plant material and plastic. The composite of claim 16 further includes (a) lignocellulosic plant material from a plant other than the genus *Parthenium*, (b) added *Parthenium spp.* natural resin extract or (c) combinations of (a) and (b). This is discussed by Applicants in Applicants’ specification at paragraphs [0010], [0030], and [0031]. As discussed in [0030], plant material derived from *Parthenium spp.* may be combined with plant material from one or more plants of other than the genus *Parthenium* to make the composites of the invention. As discussed in [0031] naturally occurring resin extracted from *Parthenium spp.* may be combined with plant material from *Parthenium spp.* to make the composites of the invention.

In view of the foregoing, it is submitted that claim 16 fully meets the requirements of 35 U.S.C.112, second paragraph.

Rejection Under 35 U.S.C. 103

Claims 1-19 stand rejected under 35 U.S.C. under 35 U.S.C. 103(a) allegedly as being unpatentable over Kay et al. (U.S. Patent No. 4,647,607) in view of Bultman et al. (*Proceedings of 4th International Conference*, Dec. 1989, pages 353-356). In particular, the Examiner alleges that Kay et al. disclose synthetic rubber with guayule resin stabilization (abstract). Rubbers that can be stabilized are those with ethylenic

unsaturation including styrene-butadiene, ethylene-propylene copolymer etc. Guayule resin is added at 0.5 to 20 parts by wt. per 100 parts by wt of synthetic rubber. Guayule plant, which produces guayule resin, is processed by a certain method. The Examiner further states that Kay et al. fail to disclose *Parthenium* plant (of instant claim 1).

~~The Examiner states that Bultman et al. describe the evaluation of guayule resin as a pesticide. *Parthenium argentatum* is a guayule plant from which guayule resin is obtained.~~

The Examiner concludes it would have been obvious to one of ordinary skill in the art that the guayule resin used by Kay et al. is obtained from *Parthenium argentatum* plant (as disclosed by Bultman et al.).

The Examiner further states that the prior art is silent about bagasse (of instant claim 3), various forms of plant material (of instant claim 6), thermosetting polymers (of instant claim 1), virgin and recycled plastic (of instant claim 13) and particle board or fiberboard (of instant claim 15). It is the examiner's position that it would have been obvious to a person of ordinary skill in the art to (a) use bagasse of a plant in order to minimize waste (since bagasse may contain some useful guayule resin), (b) use thermosetting polymers, virgin as well as recycled plastic since these polymers are also expected to be equally suitable like those disclosed by Kay and also (c) make articles like particle board or fiber board since these articles are conventionally made from plant materials.

The Examiner then states the prior art is also silent on termite infestation, resistance to fungi and termite (of instant claims 17-19). Since the prior art discloses a composition having (claimed) ingredients, in proportions that are similar to or overlap those that are claimed, it is reasonable to assume that the disclosed composition inherently satisfies limitations encompassed by instant claims 17-19.

Argument

Applicants respectfully disagree with the Examiner's interpretation of the teachings of the references and his conclusions.

Applicants respectfully submit that the claims define an invention which is unobvious over the cited art. For the reasons discussed in detail below, Applicants further submit that none of the references teach or suggest Applicants' invention, either taken alone or in combination.

The cited art does not support a proper obviousness rejection of the claims as provided by *Graham v. John Deere*, 148 USPQ 459 (Sup. Ct. 1966), which must delineate each of: (1) the difference between the claimed invention and the applied references, (2) the modification of the applied references necessary to arrive at the claimed invention and (3) a prior art citation suggesting the desirability of such modification.

Overview of the Invention

1. Applicants' claimed invention is directed to wood composites comprising *Parthenium* spp. lignocellulosic plant material and plastic. The *Parthenium* spp. lignocellulosic plant material may comprise (a) whole plant material, (b) plant part material, (c) bagasse, or (d) a combination of (a) - (c) [claim 3]. The plant material may be plant material that has been processed [claim 4] by a mechanical or chemical reduction process [claim 5] and the processed *Parthenium* spp. plant material may comprise fibers, fiber bundles, particles, flour, chips, flakes, fines, sawdust, pellets, strands, wafers or combinations thereof [claim 6]. The *Parthenium* species may comprise *Parthenium argentatum*, *Parthenium tomentosum* or *Parthenium incanum* [claim 2]. Products made from composites of the invention can be used to make numerous items, particularly those used for construction such as lumber, plywood, particleboard, fiberboard, poles, railroad crossties, or the like.

2. The composites of the invention fulfill a long-felt need for composites that possess insect, fungal, and other bio-resistant properties.

As discussed in detail below, the invention defines a product that is not taught or suggested by the cited art, either alone or combination, and the composites of the invention fulfill a long felt need.

Detailed Discussion

The Prior Art Does Not Teach the Critical Elements of Applicants' Invention

Applicants submit that the prior art, either alone or in combination, does not teach the critical features which are essential to Applicants' invention.

Applicants' claimed invention differs from the cited references with regard to: (1) starting materials used to prepare the claimed products, (2) the process of making the products, (3) the products obtained, and (4) properties of the products. These differences are set forth in the attached Table A and discussed in detail below.

Kay et al. (U.S. Patent No. 4,647,607), the primary reference cited by the Examiner, teaches use of **extracted guayule resin** (col. 1, lines 49 to 54; col. 3, lines 1-37; col. 4, line 39 to col. 5, line 5; col. 6, lines 23-28) as a thermooxidative stabilizer (Abstract, and col. 1, line 12) for a synthetic elastomer (col. 2, lines 26-28 and 38-41), e.g., rubber. The extraction of the guayule resin is carried out using a polar solvent. The extracted guayule resin is mixed with synthetic rubber which is obtained by emulsion or hydrocarbon solvent techniques using polar solvents.

The product of the Kay et al. process is a guayule resin-synthetic rubber mixture thermooxidatively stabilized with guayule resin. The mixture has utility for the "general uses of synthetic rubber, for example, tires, conveyor belts, roofing membranes, shock absorbers, and various other rubber articles" (col. 4, lines 4-6).

In contrast, Applicants' invention uses lignocellulosic plant material and plastic to obtain a wood-based composite for use for products, such as those used for construction such as lumber, plywood, particleboard, fiberboard, poles, railroad crossties, or the like

(in the specification, [0014]). The product obtained is a wood-type product which is obtained using bonding procedures developed for wood composites. The composites have insect, fungal, and other bio-resistant properties. Surprisingly, Applicants found that although the biological control factors reside in the natural resin extract, they obtained composites having excellent termite resistance and decay resistance by **direct use of *Parthenium* spp.** whole plant, plant parts or bagasse material to make the *Parthenium* spp.-plastic composites of the invention. That is, termite and fungus-resistant products were obtained while **avoiding the need to extract the natural resin from *Parthenium* spp.**" (in the specification, [0012], emphasis added).

There is nothing in the Kay et al. patent to teach or suggest the critical elements of Applicants' invention, namely, starting materials, process used, product obtained, and product properties. The Kay et al. patent requires elements which are not required by Applicants' invention, namely, extracted resin. Further, the Kay et al. patent is devoid of any teaching or suggestion of the use of *Parthenium* spp. lignocellulosic plant material and plastic to obtain wood-plastic composites useful to make wood products, e.g., lumber, plywood, particleboard, fiberboard, etc., which have resistance to termite infestation and resistance to fungal decay.

Kay et al. Is Directed to Nonanalogous Art

For purposes of evaluating the obviousness of claimed subject matter, a reference relied upon must constitute "analogous art" (*In re Clay*, 23 USPQ2d 1058 (Fed. Cir. 1992). In the instant case, the Kay et al. patent does not constitute analogous art to Applicants' invention. Kay et al. is directed to synthetic rubber.

Lignocellulosic-plastic composites of the invention, i.e., wood-plastic composites which have resistance to termite infestation and fungal decay and which are useful to make wood products, particularly for construction, such as lumber, plywood, particleboard, fiberboard, etc. and the Kay et al. synthetic rubber products which are

useful for tires, conveyor belts, etc. are separate fields of endeavor which deal with different elements.

In sum, Kay et al. is directed to nonanalogous art from Applicants' invention. Further, the critical elements essential for Applicants' invention are not taught or suggested by Kay et al.

Bultman et al. Reference

The secondary reference does not cure the deficiencies of Kay et al. Applicants submit that the Bultman et al. reference, either alone or in combination with Kay et al., does not teach the critical features essential for Applicants' invention.

Bultman et al. describe the use of **extracted** guayule resin (*Parthenium argentatum*) which is used **full-strength** to impregnate pine sapwood using a modified Bethel full-cell, vacuum/pressure technique (page 353). To perform this impregnation it was necessary to heat the resin to approximately 70°C to reduce the viscosity sufficiently to obtain a free-flowing liquid. The preheated resin was then transferred into the evacuated treating chamber which was subsequently pressurized. The pickup of resin by the wood under these conditions of impregnation varied (pages 353-354). The authors state on page 355 that the "limited field data" indicate that the non-rubber extractives (resin) may be useful as antitermitics.

The Bultman et al. reference, either alone or in combination with Kay et al., does not teach the critical features essential for Applicants' invention. In particular, Bultman et al. do not teach or suggest the use of *Parthenium* spp. lignocellulosic plant material and plastic; do not teach or suggest making wood-plastic composites, and do not describe methods for making wood-plastic composites. Further, there is no teaching or suggestion that wood material having naturally occurring resin would have any termite or resistance properties. Further, Bultman et al. is devoid of any teaching of use of plastic.

Further, Bultman et al. require elements which are not required by Applicants' invention, namely, extracted and processed, full-strength resin. Bultman et al. obtained

the resin material from the Firestone Rubber and Tire Company process (Wagner and Schloman, 1991, Processing. In: Whitworth, J.W. and Whitehead, E.E. Guayule Natural Rubber. Office of Arid Lands Studies. University of Arizona, Tucson, AZ. pp. 261-286). In the Firestone rubber extraction process, the resin and rubber are removed simultaneously with an azeotropic mixture of organic polar and nonpolar solvents at elevated pressure and temperature from the plant material (Wagner and Schloman, 1991, supra). This procedure maximizes the extraction of both rubber and resin from the guayule plant, and thus, the resin will contain some of the antioxidants that are used to protect the rubber fraction from oxidation and reduction in physical properties needed to make tires. That is, this resin consisted of antioxidants and some rubber that were mixed together. This resin could be considered as processed resin. Further, Bultman et al. specifically state that the extracted resin is used full-strength.

In contrast to Bultman et al., Applicants' invention uses lignocellulosic plant material and plastic to obtain a wood-based composite. The resin in the plant material is NOT extracted or processed and is as close to its natural state and still remains as part of the plant material. Surprisingly, however, Applicants found that although the biological control factors reside in the natural resin extract, they obtained composites having excellent termite resistance and decay resistance by direct use of *Parthenium* spp. whole plant, plant parts or bagasse material to make the *Parthenium* spp.-plastic composites of the invention. That is, termite and fungus-resistant products were obtained while avoiding the need to extract or process the natural resin from *Parthenium* spp.

In sum, the critical elements essential for Applicants' invention are not taught or suggested by Bultman et al.

There is No Motivation to Combine the References As Suggested by the Examiner

To support a rejection under 35 U.S.C. 103, there must be some teaching in the prior art that suggests the desirability or incentive to make the modification needed to arrive at the claimed invention. In the instant case, the cited art is devoid of such a

teaching to combine the references as suggested by the Examiner. As noted above, the Kay et al. reference is directed to nonanalogous art. There is no basis to combine the Kay et al. patent, which teaches production of synthetic rubber, and the Bultman et al. reference, which describes impregnation of pine sapwood with full-strength, extracted, processed, heated free-flowing guayule resin, and the cited art is devoid of any teaching to combine the references.

Motivation Is Lacking Where the Proposed Modification by the Examiner Would Destroy the Intended Function of the Cited Reference

It has been determined that if a proposal for modifying the prior art in an effort to attain the claimed invention causes the art to become inoperable or destroys its intended function, then the requisite motivation to make the modification would not have existed. In the instant case, modification of Kay et al. with the teachings of Bultman et al. as suggested by the Examiner would destroy the function of Kay et al. to produce synthetic rubber. This is further evidence of that motivation to combine the two references is lacking.

Even if One Made the Combination Suggested, One Would Not Obtain the Claimed Invention

As discussed in detail above, the references do not teach or suggest the critical features of Applicants' invention. There is no teaching of lignocellulosic plant material and plastic. Thus, even if one made the combination of references suggested by the Examiner, one would not obtain the claimed invention.

The Invention Fulfills a Long-Felt Need

The composites of the invention fulfill a long-felt need for composites that possess insect, fungal, and other bio-resistant properties. As shown in Applicants' Examples, the composite of the invention showed complete termite resistance (see Table 1, page 25 of the specification), and had better termite resistance compared to Southern pinewood treated with 10.3% or 51.8% extracted, full-strength resin and equal termite

resistance compared to Southern pinewood treated with 97% extracted, full-strength resin. This resistance of the invention composition was obtained while avoiding the step of extracting the resin from the *Parthenium* plant. Additionally, the invention provides unexpected results as Applicants' data shows that the composites of the invention made from plant material which contain resin in about 10% natural content in the plant and in the natural state (i.e., unprocessed, unextracted, and not applied at full-strength) appears to be better than the extracted, processed, full-strength resin of Bultman et al. because the 10% natural content in the plant is just as effective as the 90% or greater processed resin treatments (see Table 1, page 25 of the specification).

Further, the composite of the invention had greater resistance to decay from *Poria placenta* compared with southern pine wood treated with extracted guayule resin at any level (see Table 3, page 27 of the specification).

Applicants Respectfully Disagree With the Assertions of the Examiner

In the last paragraph of item 4 of the Office Action, the Examiner stated that the prior art discloses a composition having (claimed) ingredients, in proportions that are similar to or overlap those that are claimed, it is reasonable to assume that the disclosed composition inherently satisfies limitations encompassed by instant claims 17-19. This is not true. As discussed in detail above, there is no teaching of *Parthenium* spp. lignocellulosic-plastic composites.

In view of the foregoing, Applicants respectfully submit that the cited references do not support an obviousness rejection.

Summary and Conclusions

The claims, as amended, fully meet the requirements of 35 U.S.C. 112.

None of the cited references taken alone or in combination teach Applicants' invention or suggest an expectation of success of Applicants' claimed invention; thus, the claims are unobvious over the cited art.

Docket No. 0217.97R
Serial No. 09/828,634

PATENT

If the Examiner has any questions, comments or suggestions, the undersigned attorney earnestly requests a telephone conference.

Respectfully submitted,

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Enclosures:

Appendix I (Marked-up Version Showing the Changes Made)

Appendix II (Clean Version of the Entire Set of Pending Claims Following Entry
of the Enclosed Amendment)

Table A

Title pages and Chapter 13 (pages 87-92): "How Crops Can Provide Raw Materials for
the Chemical Industry," in the *1992 Yearbook of Agriculture: New Crops, New Uses,
New Market*, Office of Publishing and Visual Communication, U.S. Department of
Agriculture

Record from *The American Heritage® Dictionary of the English Language*, Fourth
Edition, 2000

Title page and pages G-13 to G-14 from *Wood Handbook: Wood as an Engineering
Material*, General Technical Report FPL-GTR-113, Forest Products Laboratory,
Forest Service USDA, March 1999

Accompanying Enclosures:

FY2002 Fee Transmittal (2 copies)

Petition for Extension of Time (1 copy)

Postcard Receipt

Docket No. 0217.97R
Serial No. 09/828,634



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APPENDIX I

MARKED-UP VERSION SHOWING THE CHANGES MADE

Insertions are shown by underlining; deletions are shown by brackets or strike overs.

In the Specification

Paragraph [0041] on page 9 has been amended as follows:

[0041] Lignocellulosic materials are any of several combinations of lignin, cellulose, and hemicellulose, forming the essential part of woody tissue.

In the Claims

1. (Once amended) A composite comprising *Parthenium* spp. lignocellulosic plant material and plastic.

16. (Once amended) The composite of claim 1, wherein the *Parthenium* spp. plant material further comprises (a) lignocellulosic plant material from a plant other than the genus *Parthenium*, (b) added *Parthenium* spp. natural resin extract or (c) combinations of (a) and (b) thereof.

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